WORKING PROCEDURE

WP 033

Title	Page Number
PNGV Dynamometer Load Cell Calibration	1 of 12
Originator	**Supersedes**
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Responsible Organization	**Computer Program**
Clean Car/PNGV Group	PowerTek System
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Cal Plot for tqDYNO_CASE and Calibration Summary	N/A
Report Distribution	**Implementation Date**
Dynamometer Calibrations Records cabinet.	04-30-2000

Implementation Approval

Original Test Procedure Authorized by EPCN #266 on 04-30-2000

Revision Description

Note: Specific brand names in this procedure are for reference only and are not an endorsement of that product.

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1. Purpose

The purpose of this procedure is to document the steps required to perform the dynamometer load cell calibration for PNGV cells.

2. Test Procedure

101 Press E Stop, the mechanical red emergency button.

102 Ensure that the driveshaft is disconnected. If it is in place, remove the four bolts holding the cover in place, and then remove the cover plate.

In some cells, you can only remove 2 bolts, and then the cover can be raised while it remains attached on the one side.

103 Remove the 4 bolts connecting the driveshaft mounting flange to the dynamometer. See Figure 1.

Use a pry-bar to disengage the driveshaft from its seat, so that it is not touching the dynamometer shaft.

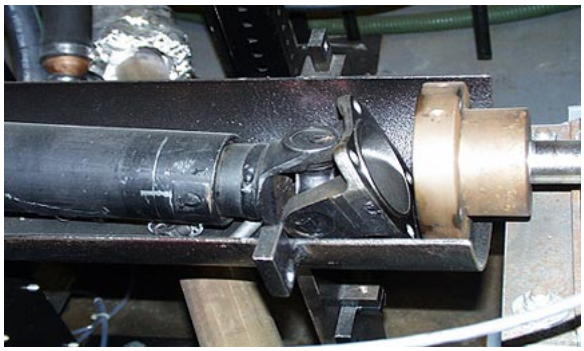


Figure 1
Disengaged Driveshaft

104 If the PowerTek VX-In Engine controller computers and monitor are not turned on, follow WP 031 “PNGV Start VX-In” for the startup procedure.

On the cell’s Controller monitor, open the “Displays” toolbar, select “Softpanel”, and then select “EPA_BTN_BREAKIN’ from the scroll menu.

105 Turn on the dynamometer by clicking the “Enable Drive” button under “Log #1”.

106 Once the dyno is turned on, visually verify that the fans on the dyno are operating. Inspect the two oil flow gauges on opposite sides of the dyno to verify that oil is dripping at the rate of 60 ±10 drops per minute or approximately one drop per second.

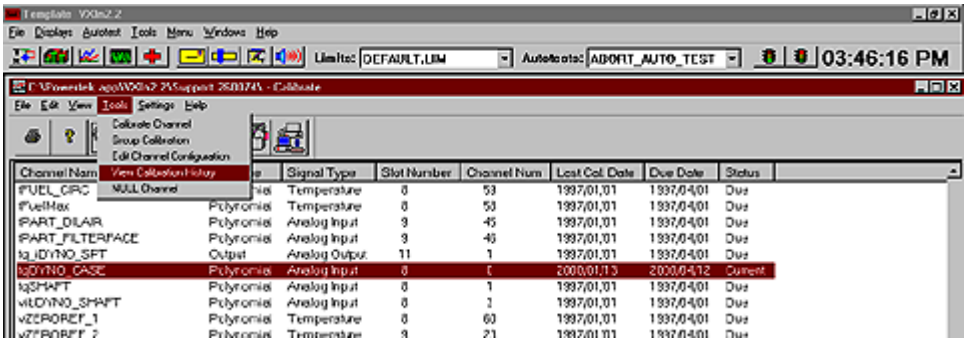
Figure 2
Oil Flow Gauge

107 In the cell, attach the pair of calibration arms to the dyno. Each dynamometer has its own set of arms identified by the matching ID number found on the arm and on the arm attachment. See Figure 3. The ID number also appears on the cover of the metal storage container of the weights. Correct connection of each arm is evident by the completion of the small circle between the set of identical numbers on the arm and the arm attachment.

Figure 3
Calibration Arm Attachment

108 On the controller monitor, open the “Displays” toolbar and select “Special” then select “Calibrate”.

109 On the “Calibrate” screen, scroll up or down the “Channel Names” until “tqDYNO_CASE” appears. See Figure 4. Double click on “tqDYNO_CASE”.



Selecting tqDYNO_CASE

110 “Operator ID” prompt will appear. Enter the operator ID and press “OK”. Verify that the channel name is ”tqDYNO_CASE”.

111 The “Signal Display” screeen will appear. See Figure 5. Next to “Polynomial Order” select the field area by doubleclicking on it and type in ‘3’.

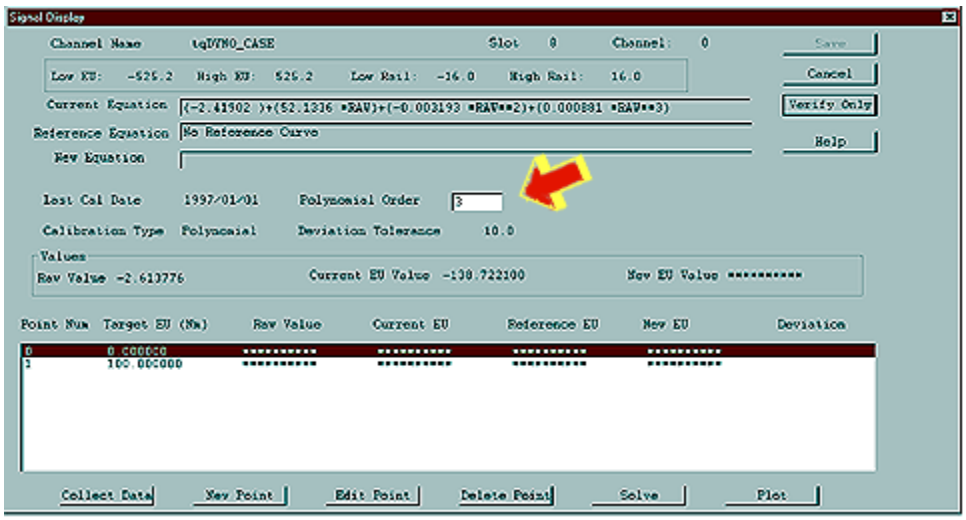


Figure 5
Signal Display

112 In the bottom panel of the "Signal Display" screen, verify that "Target EU" 0.000000 is listed. If it is listed, highlight it and click on the "Collect Data" button. A raw value will appear next to "Target EU".

113 If the Target EU 0.000000 is not listed on the Signal Display screen, click on "New Point" button. The "Setpoint Editor" window for Target EU will appear. See Figure 6.

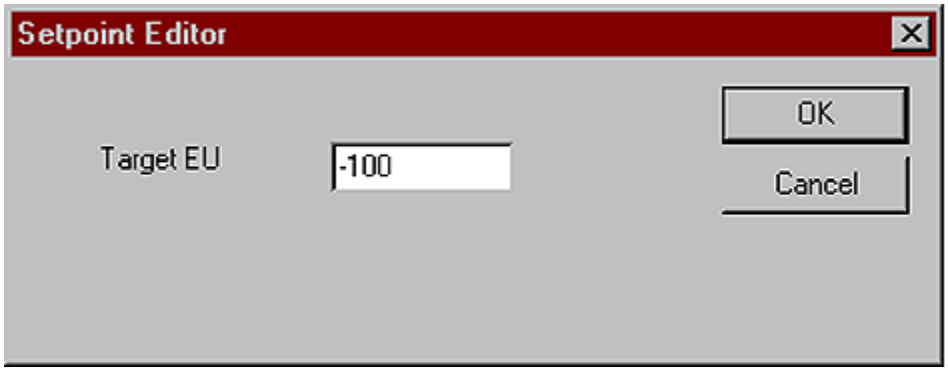


Figure 6
Setpoint Editor

114 Select the entry window for Target EU by clicking the mouse on it. Then type in "0.00" and click on "OK". When the "Signal Display" screen appears, highlight Target EU "0.000000" and then click on the "Collect Data" button. A raw value will appear next to "Target EU".

In preparation for adding weights on the arms, the determination of positive and negative changes relies on the direction of the arrow point on the drive shaft mount. The arrow points to the positive side. See Figure 7.

Figure 7
Direction Arrow

115 In the cell, attach the hang basket to the negative side arm of the drive shaft. The basket represents 100 Newton-meters. Once attached, tap on it to remove hysteresis.

116 In the bottom panel of the "Signal Display" screen,verify that Target EU "-100" is listed. If it is listed, highlight it and click on the "Collect Data" button. A raw value will appear next to "Target EU".

117 If the Target EU -100 is not listed on the Signal Display screen, click on "New Point" button. The Setpoint Editor for Target EU will appear.

Select the entry window for Target EU by clicking the mouse on it. Then type in "-100" and click on "OK".

When the "Signal Display" screen appears, highlight Target EU "-100" and then click on the "Collect Data" button. A raw value will appear next to the "Target EU".

118 In the cell add a second weight which represents 100 Newton-meters to the hang basket for a total of -200 Newton-meters. Once attached, tap on it to remove hysteresis.

119 In the bottom panel of the "Signal Display" screen, verify that Target EU '-200' appears. If it is listed, highlight it and click on the "Collect Data" button.

If it is listed, highlight it and click on the "Collect Data" button. A raw value will appear next to "Target EU".

120 If the Target EU -200 is not listed on the "Signal Display" screen, click on "New Point" button. The "Setpoint Editor" window for Target EU will appear.

Select the entry window for Target EU by clicking the mouse on it. Then type in "-200" and click on "OK".

When the "Signal Display" screen appears, highlight Target EU "-200" and then click on the "Collect Data" button. A raw value will appear next to "Target EU".

121 In the cell add a third weight which represents 100 Newton-meters to the hang basket for a total of -300 Newton-meters. Once attached, tap on it to remove hysteresis.

122 In the bottom panel of the "Signal Display" screen, verify that "Target EU" -300 is listed. If it is listed, highlight it and click on the "Collect Data" button. A raw value will appear next to "Target EU".

123 If the "Target EU" -300 is not listed on the "Signal Display" screen, click on the "New Point" button. The "Setpoint Editor" window for "Target EU" will appear.

Select the entry window for Target EU by clicking the mouse on it. Then type in "-300" and click on "OK".

When the "Signal Display" screen appears, highlight Target EU "-300" and then click on the "Collect Data" button. A raw value will appear nest to the "Target EU".

124 In the cell add two more weights that represent 100 Newton-meters each and a weight that represents 50 Newton-meters to the hang basket for a total of -550 Newton-meters. Once attached, tap on it to remove hysteresis.

125 In the bottom panel of the "Signal Display" screen, verify that "Target EU" -550 is listed. If it is listed, highlight it and click on the "Collect Data" button. A raw value will appear next to "Target EU".

126 If the Target EU -550 is not listed on the "Signal Display" screen, click on "New Point" button. The "Setpoint Editor" window for Target EU will appear.

Select the entry window for Target EU by clicking the mouse on it. Then type in "-550" and click on "OK".

When the "Signal Display" screen appears, highlight Target EU "-550" and then click on the "Collect Data" button. A raw value will appear next to "Target EU".

127 Begin removing the weights, one by one, in the order they were added and check the raw value with each removal. Each time the weight is detached, tap on the basket to remove hysteresis.

On the screen, check the raw value with each removal. The raw value should match the current EU value for each weight within ± 1% of the total value. Once all the weights are removed from the negative side, repeat the calibration process on the positive side.

128 In the cell, attach the hang basket to the negative side arm of the drive shaft. The basket represents 100 Newton-meters. Once attached, tap on it to remove hysteresis.

129 In the bottom panel of the "Signal Display" screen, verify that "Target EU" 100 is listed. If it is listed, highlight it and click on the "Collect Data" button. A raw value will appear next to "Target EU".

130 If the Target EU 100 is not listed on the "Signal Display" screen, click on "New Point" button. The "Setpoint Editor" window for Target EU will appear.

Select the entry window for Target EU by clicking the mouse on it. Then type in "100" and click on "OK".

When the "Signal Display" screen appears, highlight Target EU "100" and then click on the "Collect Data" button. A raw value will appear next to "Target EU".

131 In the cell add a second weight which represents 100 Newton-meters to the hang basket for a total of 200 Newton-meters. Once attached, tap on it to remove hysteresis.

132 In the bottom panel of the "Signal Display" screen, verify that "Target EU" 200 is listed. If it is listed, highlight it and click on the "Collect Data" button. A raw value will appear next to "Target EU".

133 If the Target EU 200 is not listed on the “Signal Display” screen, click on “New Point” button. The “Setpoint Editor” window for Target EU will appear.

Select the entry window for Target EU by clicking the mouse on it. Then type in “200” and click on “OK”.

When the “Signal Display” screen appears, highlight Target EU “200”and then click on the “Collect Data” button. A raw value will appear next to “Target EU”.

134 In the cell add a third weight which represents 100 Newton-meters to the hang basket for a total of 300 Newton-meters. Once attached, tap on it to remove hysteresis.

135 In the bottom panel of the “Signal Display” screen, verify that “Target EU” 300 is listed. If it is listed, highlight it and click on the “Collect Data” button. A raw value will appear next to “Target EU”.

136 If the Target EU 300 is not listed on the “Signal Display” screen, click on “New Point” button. The “Setpoint Editor” window for Target EU will appear.|

Select the entry window for Target EU by clicking the mouse on it. Then type in “300” and click on “OK”.

When the “Signal Display” screen appears, highlight Target EU “300” and then click on the “Collect Data” button. A raw value will appear next to “Target EU”.

137 In the cell add a fourth weight which represents 100 Newton-meters to the hang basket for a total of 400 Newton-meters. Once attached, tap on it to remove hysteresis.

138 In the bottom panel of the “Signal Display” screen, verify that “Target EU” 400 is listed. If it is listed, highlight it and click on the “Collect Data” button. A raw value will appear next to “Target EU”.

139 If the Target EU 400 is not listed on the “Signal Display” screen, click on “New Point” button. The “Setpoint Editor” window for Target EU will appear.

Select the entry window for Target EU by clicking the mouse on it. Then type in “400” and click on “OK”.When the “Signal Display” screen appears, highlight Target EU “400” and then click on the “Collect Data” button. A raw value will appear next to “Target EU”.

140 n the cell add another weight that represents 100 Newton-meters and a weight that represents 50 Newton-meters to the hang basket for a total of 550 Newton-meters. Once attached, tap on it to remove hysteresis.

141 In the bottom panel of the “Signal Display” screen, verify hat “Target EU” 550 is listed. If it is listed, highlight it and click on the “Collect Data” button. A raw value will appear next to “Target EU”.

142 If the Target EU 550 is not listed on the “Signal Display” screen, click on “New Point” button. The “Setpoint Editor” window for Target EU will appear.

Select the entry window for Target EU by clicking the mouse on it. Then type in “550” and click on “OK”.

When the “Signal Display” screen appears, highlight Target EU “550”and then click on the “Collect Data” button. A raw value will appear next to “Target EU”.

143 Begin removing the weights, one by one, in the order they were added and check the raw value with each removal. Each time the weight is detached, tap on the basket to remove hysteresis.

On the screen, check the raw value with each removal. The raw value should match the current EU value for each weight within ± 1% of the total value.

144 Once all the positive weights are removed, click on the “Solve” button. Verify that you have new EU numbers in the panel.

145 Click on the “Plot” button.

146 The “Cal Plot for tqDYNO_CASE” appears. See Figure 8. Verify that the plot forms a straight line.

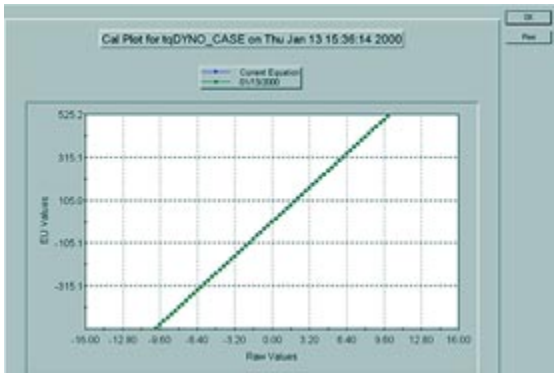


Figure 8
Cal Plot for tqDYNO_CASE

147 In the upper right corner of the “CalPlot” display, press the “Print” button.

148 Click on the “OK” button of the Cal Plot display to return to the Signal Display screen.

149 Click on “Save” button of the Signal Display to return to the “Calibrate” screen.

150 On the “Calibrate” screen, select “Tools” menu, and from the menu select “View Calibration History”.

151 Ensure that “tqDYNO_CASE” appears on the “Review History” screen in the “Channel Name” box. See Figure 9.

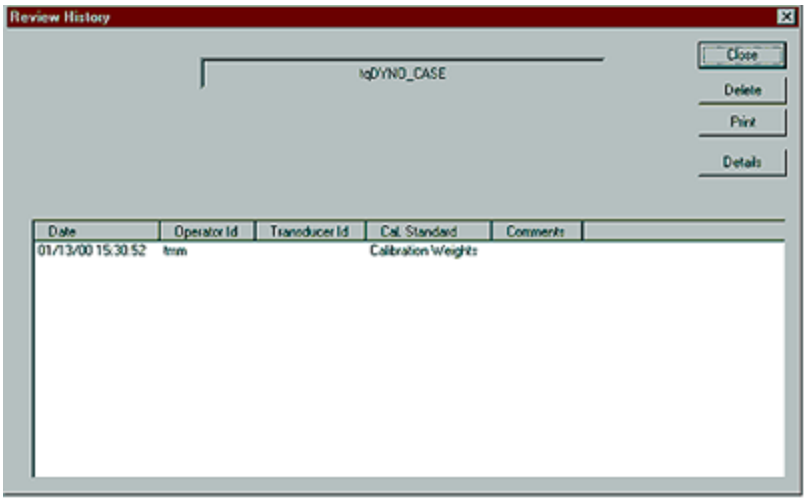


Figure 9
Review History Screen

152 From the list in the bottom display, highlight the calibration that was just performed.

153 Click on the “Print” button in the upper right hand corner.

154 Click “OK” when the “Print” screen appears.

155 A calibration report will be printed. On the “Review Hisory” screen, click “Close”.

156 On the “Calibrate” screen, click on the “File” menu and select “EXIT”.

157 In the cell, remove the calibration arms for the dyno, and return them with the bolts to their storage box.

158 Re-attach driveshaft to dynamometer by loosely threading the bolts to the mounting flange.

159 Tighten one bolt with a torque wrench to 65 ft.-lbs. Use a prybar to rotate the driveshaft.

160 Tighten with a torque wrench the bolt opposite the first one to 65 ft-lbs. Use a prybar to rotate the driveshaft.

161 Use the torque wrench to tighten the third bolt to 65 ft-lbs. Use a prybar to rotate the driveshaft.

162 Tighten the remaining bolt with the torque wrench to 65 ft-lbs.

163 Repeat the procedure used in Steps 159-161 to tighten the four bolts with a torque wrench to 75 ft-lbs.

164 Replace the driveshaft cover by securing either the removed four or the removed two bolts back to it.

165 Shut down the computer by following the steps in WP 032 “PNGV Stop VX-In”.

166 Staple the “Cal Plot for tqDYNO_CASE” and “Calibration Summary” printouts together and place them in the “Dynamometer Calibrations Records” cabinet.

3. Acceptance Criteria

3.1 The oil in the two oil flow gauges must be dripping at the 60 ±10 drops per minute rate.

3.2 The raw value must match the current EU value for each weight within ± 1% of the total value.

3.3 The Cal Plot data visually forms a straight line.

3.4 The Cal Plot for tqDYNO_CASE” and “Calibration Summary” printouts are filed in the “Dynamometer Calibrations Records” cabinet.

3.5 The four bolts to the mounting flange are tightened to 75 ft.-lbs.